COMMITTEE ON SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENATIVES

HEARING CHARTER

Electronic Waste: Investing in Research and Innovation to Reuse, Reduce, and Recycle

Wednesday, February 11, 2009
10:00 a.m. to 12:00 p.m.
2318 Rayburn House Office Building

Purpose

On February 11, 2009, the Science and Technology Committee will receive testimony on draft legislation entitled "The Electronic Waste Research and Development Act of 2009." Witnesses will provide their comments on, and suggestions to, the bill. They will also discuss ways in which research and development (R&D) can help address the challenge of managing the disposal of electronics products in the United States. Five witnesses, representing perspectives from academia, a non-profit, electronics producers, and electronics recyclers, will offer testimony.

Witnesses

- **Dr. Valerie Thomas,** *Anderson Interface Associate Professor, Georgia Institute of Technology.* Dr. Thomas will discuss her research on innovative methods to manage electronic waste and the challenges facing the recycling and re-use of electronic products.

- **Dr. Paul Anastas,** *Teresa and H. John Heinz III Professor in the Practice of Chemistry for the Environment and Director of the Center for Green Chemistry and Green Engineering, Yale University*. Dr. Anastas will discuss the applicability of research in green chemistry and engineering to the electronics sector.

- **Mr. Philip Bond,** *President, Technology Association of America*. Mr. Bond will discuss ways in which innovation through R&D could help electronics manufacturers address the challenge of electronic waste. He will also give his views on promoting collaboration between industry and non-industry researchers to encourage the transfer of successful research into products.

- **Mr. Jeff Omelchuck,** *Executive Director, Green Electronic Council and Electronic Product Environmental Assessment Tool (EPEAT).* Mr. Omelchuck will discuss the development and utility of EPEAT, challenges to making existing

electronics products more environmentally friendly, and ways in which R&D could address these challenges.

- **Mr. Willie Cade,** *Chief Executive Officer, PC Rebuilders and Recyclers*. Mr. Cade will describe the challenges faced by electronics refurbishers and recyclers, and discuss ways to promote collaboration between academic researchers and the recycling and refurbishing businesses.

Issues and Concerns

- Electronic waste, or e-waste, the term used to describe used televisions, computers, cell phones, monitors, etc. that are ready for discard, is a growing problem in the U.S. and worldwide. The Environmental Protection Agency (EPA) estimated that between 1980 and 2004, 2 billion electronic products were sold in the U.S. Of these they estimated just over half were still in use, while 42 percent had been disposed of and 9 percent were in storage. Of the amount disposed of, only 11 percent reached recyclers. The rest went to landfills[1]. Electronics are bulky and contain hazardous materials that pose concerns for disposal in landfills. Due to the involvement of state and local governments, environmental groups, and electronics producers, more of these products are being recycled. However, as described below, there are still many hurdles to cost-effective, nationwide electronics recycling. Additionally, the biggest environmental footprint for electronics arises out of their production. Enabling consumers to use (or re-use) these products longer could reduce the impact of this production on the environment. The draft legislation discussed at this hearing will address some of the challenges to increase recycling and re-use through R&D and education.

- While e-waste recycling is increasing in the U.S., the industry faces a number of challenges. These challenges include convincing consumers to recycle, the logistics of collecting e-waste, efficiently disassembling products, safely removing hazardous substances, efficiently processing materials, and recovering value from many of the e-waste constituent materials. For instance, the more commingled a stream of plastics becomes as casings and components from products are mixed together in processing, the less value it has for re-use. Improving the technologies that sort these plastics, or developing new processes and materials that can use non-homogenous plastics will make e-waste recycling less costly and will reduce waste material. From research on influencing consumer behavior to automated methods of sending information to recyclers about the products moving through their plants, R&D could help make recycling more efficient and cheaper.

[1]EPA Fact Sheet: management of Electronic Waste in the U.S., http://www.epa.gov/epawaste/conserve/materials/ecycling/docs/fact7-08.pdf

- The design of electronic products could also aid in making recycling more cost efficient. Many products are difficult to disassemble and the location of hazardous materials varies (i.e., mercury lamps in some flat panel displays). Product design for recycling would look at the needs of end of life management. Greater use of materials recycled from old electronics is another upfront design choice that would help make recycling more profitable. Researchers could examine the feasibility of different design schemes and recycled materials usage to help electronic product development become more of a closed loop process.

- Scores of different chemicals and materials comprise computers, televisions, cell phones and other electronics. Some of the substances used in electronics (e.g. lead and hexavalent chromium) have raised enough concern that the European Union adopted a measure to ban their use in electronics products sold in Europe[2]. Manufacturers have been able to comply with these requirements for most consumer electronics, but the process to ban substances sensitive to the environment and human health is on-going. For example, the risk to human health posed by certain types of brominated flame retardants used in electronics and other products has created a controversy over their continued use. Comprehensive data on the properties of substitutes for harmful materials would enable electronics designers to change their products more quickly in response to concerns raised by different materials. The availability of this type of comprehensive data, provided by the National Institutes of Standards and Technology, enabled manufacturers to quickly meet the challenge of eliminating ozone-layer depleting chlorofluorocarbons (CFCs) from their products in the 1980's.

- Increasing the amount of electronics headed to responsible recyclers is essential to reducing the impacts of e-waste. Also essential though is research to increase and encourage the re-use of electronic products. Estimates of the total amount of energy required over a computer's lifecycle show that roughly 80 percent goes into the computer's production phase, and only 20 percent into the use phase[3]. Extending the amount of time a product is in use could not only reduce the volume of e-waste, but also lessen the impact of the production of these complex and sophisticated products on the environment. Often consumers buy new cell phones, laptops, or other devices because they want the functionality or "look" of a new model, not because their current device is broken. Consumers are often wary of purchasing used electronics because they are unsure of a used product's value or they are afraid it will not meet their needs. Developing re-use markets that aid consumers in evaluating used devices could help keep these devices in the hands of consumers for a longer period of time. Prolonging a device's use could also be accomplished by developing ways for consumers to easily upgrade their current products.

[2] The Restrictions on Hazardous Substances (ROHS) Directive, adopted buy the European Union in 2003.
[3] E. Williams (2002), "The 1.7 Kg Microchip"

- Improving the training of students equips the future workforce to design products with a minimal environmental impact. Continuing education of the existing workforce in the electronics and recycling industries informs these individuals of best-practices in their fields. Similarly, collaboration between academic researchers and those in industry can help transfer solutions to the problems identified above as fast as possible.

Background

Regulations

No federal law or national framework exists to handle the growing volume of e-waste generated by U.S. consumers. At least since 2000, with the convening of the National Electronics Stewardship Initiative, electronics producers and other stakeholders have been aware of the e-waste problem. However, because of competing interests over financing mechanisms, electronics producers, environmental groups, and consumer representatives have not been able to reach a consensus on how a national e-waste program should be implemented. In the absence of federal regulations, some states and localities have instituted mandatory e-waste recycling. California implemented a program in 2005. Maine, Washington, and Minnesota implemented e-waste programs in 2007. Other states, like Oregon, are slated to begin their programs this year. Each state program is slightly different, creating a challenge for electronics companies that now must finance the take-back and recycling of products in all states with programs (except California, where consumers pay a fee for recycling at the time of purchase). In addition, many of these companies have extended this take-back service to consumers in states without specific e-waste programs, though the service is not always free of charge.

The European Union has been ahead of the U.S. in dealing with e-waste, passing the Waste Electrical and Electronic Equipment Directive (WEEE) in 2000, which banned disposal of e-waste in landfills and required producers to take-back their used products. The actual implementation of this directive has varied country by country. In Europe, just as in the U.S., the cost of recycling is also a challenge.

Export

Another significant problem is the export of e-waste from the developed world to China and other developing nations, where low-paid workers pull apart the products to extract any valuable materials. Using crude methods, these workers are exposed to toxic substances, carrying a heavy burden on human health and the surrounding environment. While some exported electronics can be legitimately refurbished and re-used, an overwhelming quantity has no re-use value and is improperly and unsafely recycled or discarded. According to the Basel Action Network (BAN), approximately 80 percent of the e-waste directed to recycling in the U.S. is not recycled, but is instead exported. Much of this export is not illegal, though the EPA requires that any exporter of the leaded-glass cathode ray tubes (CRT) from old television certify that all CRT exports are going to legitimate processors overseas. This rule is frequently ignored and only minimally enforced. Both BAN and the Institute of Scrap Recycling Industries are

working on separate standards that would promote accountability within the electronics recycling community. These standards will be available sometime this year.

Federal Activity

When safely handled, e-waste can be a valuable source of commodities like gold and silver. These items are more enriched in these precious metals than a comparable weight of naturally occurring ore[4]. To encourage recycling, the Environmental Protection Agency (EPA) offers facts on e-waste and information to consumers about where they can find recyclers in their area on their website. EPA also has the "Plug Into eCycling Program" which is a partnership between EPA, manufacturers, and retailers to offer consumers more opportunities to recycle or donate their old electronics. An example of an initiative under the program is the campaign "Recycle your cell phone. It's an easy call." This is a national campaign supported by major manufacturers, carriers, and retailers to educate consumers about cell phone recycling. The EPA has also supported a Design for the Environment Program and Electronics Products Assessment Tool (EPEAT).

EPEAT

EPEAT receives EPA funding, and is a product of the not-for-profit Green Electronics Council. EPEAT is an assessment tool that compares the environmental attributes of different brands and models of desktop and laptop computers. Many large institutional buyers, including sectors of the Federal Government, will only buy equipment that is ranked highly by EPEAT. EPEAT convenes manufactures, environmental representatives, and other stakeholders to establish performance criteria the products must meet to attain rankings of bronze, silver, or gold. Products are rated in such categories as to the amount of environmentally sensitive material they contain, ease of disassembly for recycling, and energy conservation.

Opportunities for R&D and Education

As identified above, by supporting R&D and education, the proposed legislation can help reduce the impact of electronics products on the environment through recycling and re-use.

[4] USGS Fact Sheet 060-01: Obsolete Computers, "Gold Mine" or High-Tech Trash? Resource Recovery from Recycling, http://pubs.usgs.gov/fs/fs060-01/

Discussion Draft – *Electronic Waste Research and Development Act*

Section by Section

Section 1. Short Title
Provides the short title of the legislation, the Electronic Waste Research and Development Act

Section 2. Findings
Outlines the current background information, concerns, and impacts of electronic waste on the environment.

Section 3. Definitions
Defines the terms Administrator as the Administrator of the Environmental Protection Agency; a consortium; the term e-waste; an institution of higher learning; and the Director as the Director of the National Institute of Standards and Technology.

Section 4. Electronic Waste Engineering Research, Development and Demonstration Projects
Directs the Administrator to provide grants through a competitive, merit-based process to be done jointly with institutes of higher education, non-profit research institutions, government laboratories, and for-profit entities (i.e. manufacturers, designers, refurbishers, or recyclers) to find ways to manage electronic waste through reduction, reuse, and recycling, and make the findings of the research available to the public. The section requires a report to Congress within 2 years after enactment and every two years thereafter of the grants awarded and a list of the projects and their findings.

Section 5. National Academy of Sciences Report on Electronic Waste
Directs the Administrator to arrange a study by the National Academy of Sciences to look at the current research programs and the barriers and opportunities available to reduce electronic waste, reduce the use of hazardous materials in electronic products, and better product design for efficient re-use and recycling.

Section 6. Engineering Curriculum Development Grants
Directs the Administrator to provide grants through a competitive, merit-based process to institutes of higher education and community colleges to reduce electronic waste through better teaching and training of students and current workforce by developing a green engineering curricula and creating internships.

Section 7. "Green" Alternative Materials Physical Property Database

Directs the Director to establish a physical property database for green alternative materials for use in electronic products.